

DESIGN CRITERIA  
FOR MUNICIPAL WASTEWATER LAND TREATMENT SYSTEMS  
FOR PUBLIC HEALTH PROTECTION

WASHINGTON STATE DEPARTMENT OF HEALTH

FEBRUARY 1994

## Objective

The goal of this document is to protect the public health and prevent any unnecessary exposure to the public from land applied wastewater. The criteria reflect a managed plan that is incorporated into engineering documents submitted for approval to Ecology and the Department of Health.

## Introduction

This document is intended to clarify what requirements apply to domestic wastewater systems that land apply their wastewater. Recent legislation has required the departments of Health and Ecology to develop reclaimed water standards. Land application is an element of the reclaimed water standards. Because existing permitted land application systems fall under the definition of land application in the reclaimed water standards, it was necessary to define a land treatment system. The requirements set forth in this document are to delineate a Land Treatment Wastewater system from a Land Application System.

**Land application systems must now meet the requirements for reclaimed water projects as outlined in chapter 90.46 RCW** and the February 1993 Water Reclamation and Reuse Interim Standards, Department of Health (DOH) and Ecology. Systems defined as land treatment shall follow this design criteria or may use the 1993 Water Reclamation and Reuse Interim Standards. The requirements within this design criteria apply to:

1. Existing permitted wastewater facilities after July 1, 1995.
2. On a case by case basis as each review agency may require to satisfy facility planning or permit renewals.

## Review Agencies

The design criteria outlined for land treatment systems reflects a joint agency decision on water quality and public health issues with this treatment process. Both Ecology and DOH have statutory authority to regulate municipal wastewater treatment systems. DOH's authority focuses on the protection of public health as the result of potential exposure to wastewater. Ecology's primary role in land application/treatment systems is to regulate the quality of ground and surface waters through appropriate permits. Memorandum of agreement between the two agencies have streamlined the review processes as much as possible. As a minimum, each agency will review engineering report documents for compliance with existing state regulations. These design criteria are in addition to those items specified within WAC 173-240 "Submission of Plans and Reports for Construction of Wastewater Facilities" and "Criteria for Sewage Works Design"(Ecology).

#### Definitions

Aerosols- are particles less than .00050 mm in diameter that are suspended in air.

Alarms- means an instrument or device that continuously monitors a specific function of a treatment process and automatically gives warning of a unsafe or undesirable condition by means of a visual, audible or shut down of a treatment process.

Buffers- approved vegetation, trees or setback distances to mitigate the exposure potential of disinfected or undisinfected wastewater.

Disinfected wastewater- means wastewater in which pathogenic organisms have been controlled by chemical, physical or biological means and for the purposes of land treatment no more than 200 Fecal Coliform per 100 milliliters in any one sample (based on a minimum of weekly sampling) as determined at the entry point to the irrigation system on the land treatment site.

Land treatment system- means a wastewater treatment system that is designed, constructed and operated to treat wastewater through the use of crops, irrigation methods, ground and surface water monitoring to conform to specific water quality limits and has an agency approved site control plan.

Spray irrigation- means application of water to land by spraying it from sprinklers or orifices in piping.

Surface irrigation- means application of water to land by means other than spraying and includes drip irrigation, where water is applied from drippers or emitters.

## SECTION 1

### General design considerations

Site control, location and selection provide a balance between public health protection and water quality needs on a land treatment site. These design measures outline a managed area concept to provide treatment and access control over the irrigated area.

1. All land treatment systems shall have an approved site control plan that includes but is not limited to:
  - a. An approved location with setbacks distances from domestic wells, property lines, roads, residences and populated areas (see figure 1)
  - b. Documentation of municipal land ownership or exclusive control over the land treatment site and any site buffers.
  - c. Delineation of current and future zoning of the land treatment site that indicates a low density land use (< 1 unit per 10 acres) within 1000 feet of the land treatment site.

- d. Signs and fencing are installed to prevent unauthorized access into the land treatment site.
  - e. That all provisions of the site control plan must be legally instrumented through enforceable agreements, covenants, contracts or land purchase.
  - f. A farm management plan which addresses irrigation, cropping, harvesting, worker access issues and equipment methods that is approved by the review agencies and that is a part of the site design and the system operation and maintenance manual.
2. The site control plan shall be an addendum to the engineering report, facilities planning document. A revised site control plan shall be a part of the application for renewal of a state waste discharge permit.

#### Pre-treatment requirements

1. The minimum requirement for land treatment systems shall be wastewater equal to or better than effluent from a waste stabilization pond (as defined in WAC 173-221). In addition, to ensure that ova and cysts or parasites have been removed, quiescent settling storage for at least seven days prior to irrigation shall be provided.
2. The minimum requirement for land treatment systems shall be wastewater meeting the definition of disinfected wastewater, page 2 of this document. Disinfection may be waived by the review agencies based on engineering justification identifying a minimum of three of the following:
  - a. Increased setbacks in the predominant wind direction exceeding the requirements outlined in figure 1.

- b. Site buffers or natural features that mitigate the potential exposure to aerosols.
- c. Alarms or automatic wind shut off devices that mitigate public health concerns.
- d. Low trajectory irrigation or irrigation methods that mitigate public health concerns.
- e. Limiting wastewater treatment application periods to mitigate public health concerns.
- f. Additional site control plan measures that control the land treatment site to the satisfaction of the review agencies.

#### Irrigation management practices

1. Irrigation of land treatment sites shall not cause the effluent to pond or flow into any uncontrolled area (ie water bodies, road ditches, adjacent land).
2. Operation shall cease during periods of heavy or prolonged rainfall to prevent ground saturation and runoff. Application shall not be made to frozen ground unless otherwise approved by Ecology and Health.
3. Areas with high wind issues or high humidity may require additional irrigation controls, buffers, or setbacks to protect the public health.

## SECTION 2

#### Land treatment site characteristics

Site characteristics describe the concepts behind a land treatment area. Many of these elements are incorporated within the design considerations while others are used to judge or select a land treatment site. The following are characteristics of an existing or designed land treatment system:

1. A suitable fodder, fiber, seed or forest crop is part of the design of the land treatment system.
2. The land treatment site has been selected or controlled so that aerosols will not cause a significant public impact or the problem of aerosol has been mitigated (ie. wind direction, wind speed, natural land features).
3. Land use within required buffer distances around the land treatment site should be zoned low density ( $< 1$  unit per 10 acres). Actual zoning shall be noted in the site control plan within the engineering documents submitted to the review agencies.
4. The land treatment site is municipally owned or controlled through long term easement approved by the review agencies.
5. No frequently traveled public roads, highways, secondary highways or freeways are within the required setback distances (figure 1) of the land treatment site.
6. Public access is controlled or restricted with setbacks (figure 1), buffers or other approved control measures.
7. Warning signs are posted every 100 feet and approved fencing surrounds the land treatment site.

### SECTION 3

## Mitigation measures

Mitigation measures are used when an existing or proposed land treatment site can not meet the design elements or site characteristics needed for public health protection. The intent of mitigation measures is to limit aerosol exposure or potential contact with the wastewater.

1. The following mitigation measures may be used to provide alternatives to setbacks in figure 1 or site characteristics outlined in section 2:

a. Aerosols:

- (i) Mature trees are located to diffuse potential aerosols in the predominant wind direction.
- (ii) Low trajectory irrigation, surface irrigation, or drip irrigation methods are used instead of spray.
- (iii) High wind velocity shutoff devices are used (anemometer)
- (iv) Greater buffers, setbacks in the predominant wind direction or surface irrigation methods to decrease setbacks.
- (v) Temperature or humidity controls are used

b. Roads:

- (i) Tree buffers or additional site controls are used
- (ii) Low trajectory irrigation, surface irrigation, or drip irrigation methods are used instead of spray.



c. Setbacks:

- (i) Disinfection, or additional pre-treatment is used
- (ii) Mitigation measures outlined in (a) and (b) above are used.
- (iii) Additional site controls approved by review agencies are used.

d. Other:

- (i) Additional physical or chemical treatment measures to mitigate public health risk.
- (ii) Other means of mitigating measures that provide technical justification to reduce public health risk may be used to mitigate land treatment site deficiencies.

## SECTION 4

### General engineering requirements

1. All land treatment systems shall meet the soil and site evaluation requirements outlined in "Guidelines for the Preparation of Engineering Reports for Industrial Wastewater Land Application Systems" Ecology Publication 93-36 May 1993.
2. The engineering report shall delineate any ground water, well head protection requirements for the design of the land treatment site as outlined within WAC 173-200-090 WAC " Water

Quality Standards for Ground Water of the State of Washington".

3. Engineering report requirements as outlined in WAC 173-240-060(4) " Submission of Plans and Reports for Construction of Wastewater Facilities" and Chapter 24 in "Criteria for Sewage Works Design" (May 1985).
4. Cross-connection control requirements as outlined within WAC 246-290

## SECTION 5

### References

1. Guidelines for Water Reuse, US Environmental Protection Agency, September 1992, publication no. EPA/625/R-92/004
2. Guidelines for land Disposal of Treated Domestic Sewage Effluent in Washington State, February 25, 1976, Department of Social and Health Services (now DOH) and Department of Ecology
3. Criteria for Sewage Works Design, October 1985, Department of Ecology
4. Water Reclamation and Reuse Interim Standards, February 1993, Department of Health and Department of Ecology. Ecology publications number 93-21.

FIGURE 1

SETBACK DISTANCES FOR LAND TREATMENT SYSTEMS(1,2,3)

FACILITIES MEETING DISINFECTION REQUIREMENT

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PROPERTY LINES, LOCAL ACCESS ROADS, RESTRICTED ACCESS ROADS, HIGHWAYS-FREEWAYS	100 FEET
ANY RESIDENCE, DOMESTIC WELL,	500 FEET
ANY RESIDENTIAL AREA SCHOOL, PLAYGROUND,	1000 FEET

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FACILITIES NOT MEETING DISINFECTION REQUIREMENT(4)

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PROPERTY LINES, LOCAL ACCESS ROADS, RESTRICTED ACCESS ROADS	650 FEET
SITE ACCESS CONTROLS (by ownership or easement)	1000 FEET
ANY RESIDENCE, DOMESTIC WELL, COUNTY ROAD(improved)	1000 FEET
ANY RESIDENTIAL AREA SCHOOL, PLAYGROUND, SECONDARY HIGHWAY, FREEWAY MAIN ACCESS ROAD	1320 FEET

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- 1) All setbacks based on spray irrigation measured from edge of irrigated area.
- 2) Setbacks for surface irrigation are 100 FEET and drip irrigation are 10 FEET from the edge of application point.
- 3) Setbacks are based on public health studies, other state's regulations and to minimize exposure to aerosols from inadequately treated wastewater.
- 4) Setbacks may be reduced by mitigation measures approved by the review agencies.